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Time series forecasting of farm gate prices of fresh coconuts in three major coconut growing areas of Sri Lanka

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Coconut is a perennial crop with important food value and other endless uses for human beings. Hence, this has led to the emergence of a diversified set of industrial activities. All over the world, Sri Lanka is the fourth largest coconut producing country. The major part of Sri Lanka's coconut production comes from the Coconut Triangle, which consists of Puttalam, Kurunegala and Gampaha districts. Forecasting coconut prices can provide critical and useful information to coconut growers making production and facing real situations and uncertainties of the coconut industry. The objective of this study is to build accurate univariate or multivariate time series models to forecast the farm gate prices of fresh coconut in three major coconut growing areas (Puttalam, Kurunegala, and Gampaha) of Sri Lanka. This study evaluated the times series data on monthly farm gate prices of fresh coconut in the selected districts from January 2009 to December 2019.This paper examines three time series modelling approaches, Autoregressive Integrated Moving Average (ARIMA), Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) and Vector Error Correction (VEC) model. Root Mean Squared Error (RMSE) and Mean Absolute Percentage Error (MAPE) were used to evaluate the performance of fitted models. As the univariate time series approach, ARIMA (1,1,5) and ARIMA (2,1,2) were identified as the better models for forecasting prices of Puttalam and Gampaha based on Akaike Information Criterion (AIC) where RMSE (5.83,5.77) and MAPE (12.60,10.99) respectively. In contrast to the other two districts, Kurunegala showed a non-constant variance with the time, hence GARCH model approach was tested for the particular data series. It was found that all model coefficients were not significant in the GARCH model thus univariate models were not applicable for Kurunegala District. Therefore, multivariate time series model was carried out to find a suitable model. First, the Johansen co-integration test was applied and the results proved that there were two co-integration equations at 5% level of significance. As there were significant cointegration detected between series, VECM was applied in order to evaluate the short run properties of the cointegrated series. According to the lag selection criteria, lag 7 was selected as the optimum lag value. Considering the VEC models, the RMSE and MAPE in Puttalam, Kurunegala and Gampaha were 6.30,5.41,5.85 and 12.81,10.76,11.14 respectively. Results revealed that VECM approach worked well for forecasting Kurunegala price series. Even with long-term equilibrium relationship exists between series, VECM approach was less accurate in defining the relationship in comparison to ARIMA models for Puttalam and Gampaha price series. Therefore, that the study recommends the ARIMA models as the appropriate models to forecast the monthly farm gate prices of fresh coconut in Gampaha and Puttalam districts.

Keywords: ARIMA, Coconut Price, Time Series, VECM

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